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Polyp Localization and Segmentation in Colonoscopy Images by Means of a Model of Appearance for Polyps

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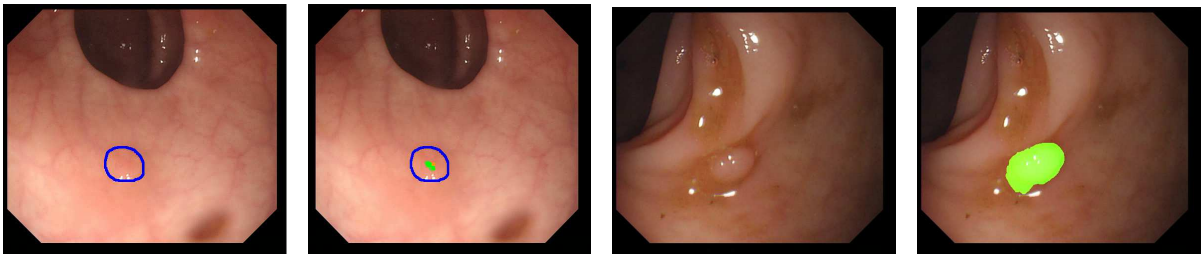
1 Summary of the thesis

Colorectal cancer is the fourth most common cause of cancer death worldwide and its survival rate depends on the stage in which it is detected on hence the necessity for an early colon screening. There are several screening techniques but colonoscopy is still nowadays the gold standard, although it has some drawbacks such as the miss rate. Our contribution, in the field of intelligent systems for colonoscopy, aims at providing a polyp localization and a polyp segmentation system based on a model of appearance for polyps.

To develop both methods we define a model of appearance for polyps, which describes a polyp as enclosed by intensity valleys. The novelty of our contribution resides on the fact that we include in our model aspects of the image formation and we also consider the presence of other elements from the endoluminal scene such as specular highlights and blood vessels, which have an impact on the performance of our methods. In order to develop our polyp localization method we accumulate valley information in a smart way order to generate energy maps related to the likelihood of polyp presence in an image region. Brighter areas of these energy maps correspond to areas likely to contain a polyp inside. These energy maps are also used to guide the polyp segmentation.



(a) (b) (c) (d)

Figure 1: Examples of the outputs of the algorithms developed during the thesis: Polyp Localization (a-b) and Polyp Segmentation (c-d).

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Our methods achieve promising results in both polyp localization and segmentation -some examples are shown in Figure 1-. Our polyp localization method improves the performance of current state-of-the-art on the only public annotated database, which was also a contribution of this thesis. Our polyp segmentation method offers regions more accurate and richer in polyp content than state-of-the-art image segmentation methods. Finally, as we want to explore the practical applicability of our methods we present a comparative analysis between physicians fixations obtained via an eye tracking device and our polyp localization method. The results show that our method is indistinguishable to novice physicians although it is far from expert physicians.

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